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Geological mineral exploration tools in the Arctic near Loki's Castle, 74 degrees N (South Knipovich Ridge)

Fernando JAS Barriga[1, 2], Rita Fonseca[1, 3], Ágata S. Dias[1, 2], Ines Cruz[1, 2], Carlos Carvalho[1, 2], Jorge MRS Relvas[1, 2], Rolf B. Pedersen[4]
1. Creminer FCUL, Lab Assoc Institute of Systems Research, Lisbon, Portugal.
2. Dep Geology, Fac Ciencias Univ Lisboa, Lisbon, Portugal.
3. Dep Geosciences, Univ Evora, Evora, Portugal.
4. Centre of GeoBiology, Univ Bergen, Bergen, Norway.

Discovery of the Loki's Castle hydrothermal vent field (2008) was a great surprise, given its size and vigour of hydrothermal discharge. Several characteristics, including the fauna, separate it from either Atlantic or Pacific-type hydrothermal sites. Concerning size and grades, data are insufficient, but it appears so far that Loki's Castle is a very large system, about 200 m in diameter. The metal contents (in discreet samples, this study) are quite interesting, with Zn up to 5.4wt% and Cu estimated at several percent in some samples. Ag attains 25 ppm and Au 1.3 ppm. The tonnage of Loki's Castle may be, tentatively, in the range of 1-5 million tones. Loki's Castle is certainly worthy of study from a mineral resource standpoint.

Very active hydrothermal discharge sites such as Loki's Castle raise the issue of the size gap between modern and ancient vms deposits (preserved in the geological record), with the latter often much larger than the former. For the land-based mining industry, a "large" vms deposit amounts to a least 25 Mt. The larger examples (supergiant deposits) exceed 150 Mt (Galley et al, 2007). We believe that this gap (by a factor of at least 20) is largely a consequence of incomplete knowledge of the present day systems. Too little attention has been given so far to deposits forming within the upper few metres of the oceanic crust, within sediments or other poorly consolidated rocks (e.g. volcaniclastics). We are studying sediments in detail to find clues of hydrothermal activity through them, and to test the possibility of some influence from within-crust microbial activity (deep biosphere).